IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

Koji YAMADA et al.	Art Unit: 1793
Application No.: 10/521,818	Examiner: Yang, J.
Filed: January 21, 2005	Attorney Dkt. No.: 12065-0020

For: METHOD AND APPARATUS FOR RECOVERING PLATINUM GROUP ELEMENTS (AS AMENDED)

REQUEST FOR RECONSIDERATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicants respectfully request reconsideration of the rejection of the claims made in the final rejection of August 21, 2009.

In maintaining the rejection based on US '305, JP '322, and US '302, the Examiner has taken the following positions:

1) Regarding the limitation of discharging the molten slag, the molten slag content with Cu 3.0% or less in the discharging step of the instant claim 1, the copper content in the molten slag is a result effective variable in term of PGM recovery rate as evidenced by JP '322.

2) This point is further evidenced by US '302. US '302 teaches that the Cu in slag is 5.55g in 1517g of slag (0.36%) in order to obtain a recovery of 99.0% PGMs (col. 20, lines 24-53 of US '302). US '302 further

teaches a copper-nickel alloy containing the vast majority of the precious metals (col. 20, lines 24-35 of US '302).

3) Therefore, it would have been obvious to one skilled in the art to have optimized the Cu in slag in order to obtain a desired recovery for the precious metals.

4) US '305 (US Patent No. 5,252,305) teaches charging, melting, enriching the PGMs, and separating steps as recited in the instant claims. Although US '305 does not specify the ascertaining the copper content of the molten slag by sampling and analyzing, both JP '322 and US '305 (sic) teach the sampling and analyzing process, and more specifically, US '305 (sic) teaches that the Cu in slag is 5.55g in 1517g slag (0.36 wt.%) in order to obtain a recovery of 99.0% PGMs (col. 20, lines 24-53 of US '302), which is within the claimed copper range of 3.0 wt.% or less as recited in the instant claims. Therefore, the method of sampling and analyzing of slag would be obvious to one skilled in the art and Applicants has not provided any unexpected results over the prior arts in the record. (The Examiner has incorrectly used "US '305" in place of "US '302" in the above paragraph).

Applicants assert that the Examiner has committed errors in the rejection and this error mandates its withdrawal. The errors are pointed out below under their respective headings.

<u>JP '322 and US '302 do NOT teach analyzing and sampling of the slag IN THE FURNACE</u>.

Critical to the rejection is the Examiner's assertion that both JP '322 and US '302 teach the step of "a copper content of molten slag in the furnace is ascertained by sampling and analyzing" as found in claim 1. Applicants submit that neither of these references teaches the sampling and analyzing of the copper content in the slag IN THE FURNACE. To the contrary, at best, the cited prior art teaches that the ascertaining and analyzing steps are performed **<u>prior</u>** to the discharge of the slag from the furnace, not IN THE FURNACE as the claims require.

Further, it is not reasonable for the Examiner to interpret the ascertaining step clause in a different fashion since the following clause, i.e., molten slag is discharged from the electric furnace when a copper content of the molten slag has been ascertained to be 3.0 wt.% or less, shows that the discharge of slag from the furnace is based on the ascertaining step. This clearly means that the slag is in the furnace when the copper content is ascertained and analyzed.

It is important to understand that the focus of the invention is determining when to terminate the smelting operation and discharge the slag from the furnace. Discharging the slag at the proper time means that the smelting process becomes highly efficient. Applicants are not claiming to be the first to make a determination as to when the slag should be discharged since the prior art uses a number of different techniques that monitor different parameters to decide the ending time of the smelting operation.

The employment of the inventive technique of ascertaining and analyzing the copper content of the slag IN THE FURNACE and basing the time of discharge of the slag from the furnace on a target copper content of 3.0% or less means that the inefficiencies of the smelting process by discharging too soon or too late are avoided. The importance of discharging at the proper time can be seen from Figure 2 of the instant application. To early of a discharge brings a lower recovery rate of PGMs. Too late of a discharge means that the energy costs for the smelting operation are too high. Thus, it is vital to discharge the slag at the proper time. This is what the invention does and is not what is found in the teachings of the applied prior art, especially JP '322 and US '302 as is alleged to be the case by the Examiner.

Applicants are arguing that they are the first to base the discharging of the slag on the ascertaining and analyzing of copper content of the slag in the furnace and discharging the slag when the copper content is 3.0% or less in the slag.

A true reading of the teachings of JP '322 and US '302 reveals that neither of these references teaches the ascertaining and sampling of the copper content in the slag in the furnace and basing the discharge of the slag on the measured copper content. Contrary to the Examiner's interpretation, this prior art does not teach the claimed step and the Examiner has committed error in the interpretation of the prior art in this regard.

In JP '322, there is no description of how to decide the time to discharge the slag from the electric furnace. In its Example 2, there is no explanation even on the slag discharge from electric furnace 3 in Fig. 1, much less on timing of it. It is the same with it Example 1. As mentioned in the previous response filed on April 10, 2009, Table 1 of JP

'322 shows the data of the materials for charging to the oxidizing furnace as recited in the instant claims. In Table 2 of JP '322, there is no data of the slag discharged from the electric furnace 3. Also, in JP '322, there is no explanation of the timing of discharging the materials from the oxidizing furnace 1.

From this, it is apparent that JP '322 does not teach the ascertaining and analyzing step of the copper content of the slag in the furnace as required by claim 1, the furnace being for melting, together with flux components and a reducing agent, and platinum-group element-containing substances. The electric furnace of the invention is not for oxidizing molten metal as is the function of the furnace of JP '322. Therefore, JP '322 does not teach nor suggest using the copper content of the slag in the electric furnace as the parameter to decide the time to discharge the slag from the furnace. All data in Tables 2 and 3 of JP '322 are data obtained from materials before discharging to the furnace or after discharging from the furnace. None of this data is from the materials IN THE FURNACE during the furnace operation wherein the concentration of the copper is varying every moment.

Since JP '322 does not teach the missing step of US '305, its combination with US '305 for any reason cannot be said to establish a *prima facie* case of obviousness against claim 1. Therefore, the rejection is flawed and must be withdrawn.

US '302 also fails to teach the steps at issue here, i.e., ascertaining and analyzing the copper content of the slag in the furnace and basing the discharge of the slag from the furnace based on the copper content being 3.0% or less as determined by the ascertaining and analyzing step.

More specifically, the data of "First-stage slag" in the Table on col. 20, lines 46-47 of US '302 shows that the data has been obtained by analyzing the slag AFTER DISCHARGE FROM A CRUCIBLE TEST in a laboratory-scale furnace in the first stage. It is apparent to one of skill in the art that the explanation set out below from col. 20, lines 24-35 does not mean that the data of the first-stage slag is one in the furnace at work and PRIOR TO DISCHARGE FROM THE FURNACE.

Col. 20, lines 24-35 reads as follows:

> A crucible test in a laboratory-scale furnace was performed using a feed comprising 1050 g of dead-roasted furnace matter (derived from 1098 g of unroasted furnace matte), 450 g of silica, and 31.5 g of carbon. This produced 1517 g of slag and 38 g of copper-nickel alloy containing the vast majority of the precious metals.

From this, it is clear that the copper content of 5.5 wt.% and nickel content of 11.7% in the first stage slag shown in the Table are values which have been obtained by analyzing a sample picked up from the 1517 g of produced slag that has been discharged from the furnace and weighed. The copper content in this produced slag is of no usage any more to decide the timing of when the slag should be discharged. In the experiment of US '302, the first stage slag ought to be discharged when the experimenter would have judged that the smelting has been sufficiently conducted in the first stage conditions. If the data relating to the slag amount would have referred to the slag in the crucible itself, US '302 would not have stated "This produced 1517 g of slag" would not have been stated." Moreover, if the data related to the slag during the smelting operation, US '302 would likely have shown data of several measurements during the smelting process, not one set of data as is the case.

Applicants assert that the Examiner has improperly interpreted the teachings of US '302 to allege that an ascertaining and analyzing step of the slag IN THE FURNACE could be employed in the process of US '305. In fact, US '302 does not teach such a step and the Examiner has committed error in the improper interpretation of the teachings of US '302. Again, US '302 does not teach the ascertaining step of claim 1 since it is required to be conducted on the slag IN THE FURNACE, and the information gleaned from this step as it relates to the copper content determines the discharge of slag from the furnace. Since US '302 does not teach these steps, even if it were combined with US '305, a *prima facie* case of obviousness would not exist against claim 1.

<u>The Examiner has committed error in interpreting the copper content of the slag of US '302.</u>

In the rejection, the Examiner has continually asserted that US '302 teaches a copper content of 0.36% in the slag amount of 1517 g. This calculation is based on an interpretation that the value of 5.55 from the Table in col. 20 of US '302 is grams.

Applicants submit that interpreting the value of 5.55 as grams in the Table of col. 20 is an incorrect interpretation of the teachings of US '302. This error means that the rejection is not valid since the copper content of the slag of US '302 does not overlap the target value of 3.0% or less.

US '302 states "this produced 1517 g of slag, and 38 g of a copper-nickel alloy containing the vast majority of the precious metals", see col. 20, lines 27-29. If the unit

of elements of the first-stage alloy and slag are shown in the Table should be taken as "gram", the total of them must be the 38 g of the copper nickel alloy and the 1517 g of slag. However, when closely looking at the Table, the totaling the amounts of Cu, Ni, Co, S, and Fe for the first stage alloy produces a value of 97.0. Totaling the same values for the first stage slag produces a value of 84.58.

If the values in the Table were to present the weight of the slag in grams, it would total to the measured value of 1517 g, but the sum of the reported values is only 84.58. Likewise, if 38 g of alloy are produced from the crucible with the 1517 g of slag, the sum of the first stage alloy should total 38 but it totals 97.0. This means that the values of Table 1 are more likely to be reported as a percentage. This percentage interpretation is more consistent with the fact that the sum of the values of the first slag alloy is close to 100%, i.e., 90. While the slag value summation is only roughly 85%, this is likely a result that not all of the slag components were analyzed or reports, thus accounting for a sum of less than 100%.

When interpreting the Table of col. 20 of US '302 to be percentage, the copper content of the slag is 5.55%, which is outside the value of 3.0% or less. This means that even if the Examiner were to use the single copper content value for the slag of US '302, how does the Examiner arrive at the claimed value of 3.0 wt.% or less. There is no basis for saying that one would employ a copper content of 3.0 wt.% as a target content for slag discharge when no such value is disclosed in US '302.

Applicants also want to reiterate the previous made argument that the single data point of US '302 is insufficient for the Examiner to say that such copper content

would be optimized such that the claimed limit is somehow obvious based on US '302. US '302 is completely silent regarding determining the point of slag discharge based on the copper content of the slag and the one data point cannot be used to allege that the claimed target is somehow obvious. Any further rejection in this regard is one totally based on hindsight and not sustainable on appeal.

The error in the interpretation of the Table of US '302 mandates withdrawal of the rejection since a proper factual foundation does not exist to support it.

The cited prior art does not teach the use of granules.

In the rejection, the Examiner relies on US '305 to allege that claimed copper source material is disclosed. In US '305, it is taught to use a copper oxide **powder** as the copper source material, see col. 4, line 34. As the Examiner knows, powders and granules are not the same. The inventors of the instant application, who are partially in common with the inventors of US '305 discovered that it is better to charge copper oxide **granules** of the claimed size since this produces improvements in the copper showering effect, whereas such improvements do not occur when using a copper oxide powder. Moreover, the inventors discovered that the preferred form of granules and claimed size range can be obtained when practicing the method of claim 4 with respect to formation of the copper source material.

The use of granules is not disclosed in the cited prior art and particularly US '305. Therefore, a *prima facie* case of obviousness does not exist with respect to the claims. Moreover, there is no teaching or suggestion to instruct the artisan to employ

granules as claimed in the process of US '305. Without any factual basis to make this conclusion, any rejection of this nature would only be based on hindsight. If the Examiner continues to maintain the rejection of claim 4, the Examiner is called upon to substantiate such a rejection with particularity.

<u>The combination of United States Patent No. 5,735,933 to Yokoyama et al. (Yokoyama) and US '305 lacks the proper reasoning.</u>

In rejection claim 3, the Examiner cites Yokoyama as an example of using a vacuum to recover PGMs. The Examiner concludes that since Yokoyama teaches that his process can be applied to all types of waste materials, that it would be obvious to employ a vacuum in the process of US '305.

This reasoning is improper since the teachings of Yokoyama that relate to all waste materials do not mean that one can merely use the vacuum of Yokoyama in all other processes. What Yokoyama is teaching is that any type of waste material can be employed in his particular vacuum process. What the Examiner is saying is that Yokoyama teaches that any process for recovering PGMs can use a vacuum. This is a distortion of the teachings of Yokoyama and, in fact, there is no basis to support the modification of the process of US '305 given Yokoyama.

Moreover, Yokoyama is a volatilization process, whereas US '305 is a melting process. The two are not even remotely similar and one of skill in the art would not pluck one variable of Yokoyama, i.e., a vacuum, and use it in the process of US '305. This is hindsight on the part of the Examiner. To employ the vacuum and volatilization

of Yokoyama in US '305 would requires a wholesale change to the process of US '305 and there is just no reason for making such a change. One of skill in the art could merely use the process of Yokoyama as an alternative to that used in US '305; not seek to somehow merge the two as is proposed in the rejection.

Further, the use of the reduced pressure atmosphere produces unexpected improvements in the process. As detailed on page 11, the last seven lines, to maintain the interior of the furnace at a pressure lower than atmospheric pressure has brought more excellent copper showering. This is further substantiation of the patentability of the features of claim 3.

<u>The average grain diameter of the copper source material produced unexpected results to rebut the optimization rejection.</u>

The Examiner takes the position that since US '305 teaches a source material size of not more than 5 mm, that the range of 0.1 to 10 mm is obvious. Applicants direct the Examiners attention to the second paragraph on page 12 that bridges to page 13 of the specification. Here, the copper showering effect is produced most efficiently when employing the claimed size range. US '305 says nothing about the showering effect and the improvement in this effect as a result of the control of the size of the source material is one that is unexpected and a rebuttal of the allegation that the claimed range is merely an obvious variation based on the suggestion of US '305. Therefore, this limitation is a further patentable distinction over the applied prior art.

The features of claim 4 are not found in the prior art and a *prima facie* case of obviousness has not been established against this claim.

In the rejection, the Examiner relies on US '305 to teach the feature of claim 4 with respect to producing the copper source material for the waste recovery.

Besides containing the claim limitations regarding the ascertaining and analyzing of the slag, claim 4 requires that the molten metal discharged from the furnace is transferred to a separate furnace in order to further enrich PGMs in the molten metal. This processing has the specified feature of producing the copper source material having the claimed average grain diameter. More particularly, the claim recites "the molten slag generated in the separate furnace is water cooled from a high temperature state to obtain a copper source material containing the aforesaid copper oxide composed of granules having a grain diameter of not less than 0.1 mm and not greater than 10 mm."

This sequence of steps is not taught in the cited prior art and claim 4 is separately patentable over this art.

Summary

To summarize based on the arguments made above, it is submitted that the Examiner has committed error in interpreting US '302 with respect to the copper content of the slag. The Examiner has also committed error in the interpretation of the teachings of US '302 and JP '322 regarding the claimed ascertaining and analyzing step. These errors mandate a withdrawal of the rejection. In addition, claims 3 and 4 are

separately patentable over the prior art since the features of these claims are not found in the prior art and the prior art is not properly combined. Therefore, the claims before the Examiner are now in condition for allowance.

Accordingly, the Examiner is requested to examine this application in light of this Amendment and pass all pending claims onto issuance.

If the Examiner believes that an interview would be helpful in expediting the allowance of this application, the Examiner is requested to telephone the undersigned at 202-835-1753.

The above constitutes a complete response to all issues raised in the Office Action dated August 21, 2009.

Again, reconsideration and allowance of this application is respectfully requested.

Please charge any fee deficiency or credit any overpayment to Deposit Account No. 50-1088.

Respectfully submitted,
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